Utilization of Papaya Micro Simplicia in the Feed on Survival Rate and Growth of Giant Freshwater Prawn (Macrobrachium rosenbergii) Juvenile

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KeyWords
Papaya Micro simplicia, Giant Freshwater Prawn, Daily Growth Rate, Feed Utilization Efficiency, Survival rate.

ABSTRACT
Feed is one of the main factors in supporting growth in giant freshwater prawn (Macrobrachium rosenbergii) farming. Addition of papain in the feed can optimize the utilization of protein by giant freshwater prawns. Papain is derived from papaya. Papain is a protease enzyme that is able to hydrolyze proteins. The purpose of this research were to determine the optimal dose of papaya micro simplicia in feed on survival and growth of giant prawns. The research used experimental method by completely randomized design (CRD) with 5 treatments and 3 replications. The treatment consists of 0% papaya micro simplicia (A); 2.25% papaya micro simplicia (B); 3.75% papaya micro simplicia (C); 5.25% papaya micro simplicia (D) and 6.75% papaya micro simplicia (E). The observed variables in this study were survival rates, daily growth rates, and feed utilization efficiency. The results showed that survival rates, daily growth rates, and feed utilization efficiency did not differ significantly among each treatments. However, the addition of papaya micro simplicia dose to feed as much as 3.75% gives the highest value on survival rates (82%), daily growth rates (1.74%/day), and feed utilization efficiency (40%).
INTRODUCTION

Giant freshwater prawn (*Macrobrachium rosenbergii*) is one of the main fisheries commodities in Indonesia due to its high economic value. Recently giant freshwater prawn culture has increased. However, problems still occurred due to lack of technology mastery and socialization of giant prawn culture system.

Intensive and semi-intensive feeding in shrimp culture is the main factor in aquaculture development. Feed is one of the biggest inputs in production cost reaching in total of 60%. Juvenile stage is a crucial stage due to its really sensitive to feed availability. As with other biota, the digestive system of shrimp in the initial stage is still simple.

The function of enzymes in feed can help to speed up the digestion process so that nutrients can be sufficiently available for shrimp to grow. Papain enzyme classified as a protease enzyme that can be found in papaya fruit. Papain enzyme can break down proteins into a simpler form, namely peptides and amino acids, due to papain enzyme can catalyze hydrolysis reaction. Enzyme addition to feed can increase feed efficiency that causes an increase in growth rate due to the level of protein absorption that will increase. Papain enzymes can usually found in several forms, one of them in simplicia form.

Simplisia consists of three groups, namely vegetable, animal, and mineral. One of the simplicia from vegetable material is papaya simplicia. Simplisia papaya shown in increasing of the growth rate and survival rate of tiger groupers, siganus fish, tilapia, catfish and carp. The purpose of this research is to obtain a microdose of papaya simplisia in a feed that can produce the best survival rate and growth rate of giant prawn seeds.

MATERIAL AND METHODS

The research was conducted at Pamarican Coordinating Center for the Development of Brackish and Sea Fish Juvenile (BPBIAPL), Pamarican District, Ciamis Regency, West Java Province during March to April 2019.

The research was conducted by using an experimental design with a Completely Randomized Design (CRD) consisting of 5 treatments and 3 repetition as follows:

1. Treatment A: 0% (control) of Micro-simplisia addition
2. Treatment B: 2.25% of Micro-simplisia addition
3. Treatment C: 3.75% of Micro-simplisia addition
4. Treatment D: 5.25% of Micro-simplisia addition
5. Treatment E: 6.75% of Micro-simplisia addition

Parameters measured in this research is survival rate, daily growth rate, and feed efficiency, while observation of growth can be seen from the increase in weight of shrimp juvenile.

**Survival Rate**

Survival rate calculated using the formula as follow:

\[
SR = \frac{N_t}{N_o} \times 100\%
\]

Description:

- **SR** = Survival of fish during the experiment (%).
- **Nt** = Number of fish at the end of the experiment.
- **No** = Number of fish at the beginning of the experiment

**Daily Growth Rate**

Daily Growth Rate calculated using the formula as follow:

\[
DGR = \frac{\ln W_t - \ln W_o}{t} \times 100\%
\]

Description:

- **DGR** = Daily Growth Rate
- **Wt** = Weight of analyzed shrimp at the end of the research (g)
- **Wo** = Weight of analyzed shrimp at the beginning of the research (g)
- **t** = Shrimp Rearing (days).
Feed Utilization Efficiency
Feed Utilization Efficiency calculated by using the formula as follow [12]:

\[ FEU = \frac{W_t - W_o}{F} \times 100\% \]

Description:
FEU = Feed Utilization Efficiency (%)
Wt = Total weight of analyzed shrimp at the end of the research (g)
Wo = Total weight of analyzed shrimp at the beginning of the research (g)
F = Total of consumed feed during the research (g)

Water Quality Parameters
Measured water quality includes, temperature, dissolve oxygen, and pH by using thermometer, DO meter, and pH meter

Data Analysis
Obtained data were analyzed by using F test with a confidence level of 95%. Continued with Duncan’s multiple region test to determine the differences between treatments if its has a significant effect on the analysis of variance (ANOVA) [13].

RESULTS AND DISCUSSION
Survival Rate
The addition of papaya micro simplicia in commercial feed did not have a significant effect on the survival rate of prawn in juvenile stadia. The results of this research are also in line with previous research who reported that the addition of papain enzymes did not have a significant effect on the survival rate of tilapia [7] and on the larvae of giant prawns fed by adding commercial papain enzymes [14].

![Figure 1. Graph of Giant Fresh Water Prawn Juvenile](image)

The survival rate of giant prawns ranging from 65% - 82% and categorized as a good category, due to the shrimp during the research has met the protein requirement needs. The feed given has a protein content of ± 35%. The protein content of feeds used meets the requirements of giant prawn protein requirements, which is 30%, so that giant prawns have enough energy to adapt[15].

Daily Growth Rate
The results during 42 days of research found that the largest daily growth rate of shrimp juvenile was at the treatment dose of 3.75%, which amounted to 1.74% / day. This result is better than other studies of commercial papain enzymes at a dose of 0.1% that has a daily growth rate of giant prawn juvenile by 1.41% / day [14].

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Survival Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (0%)</td>
<td>70%</td>
</tr>
<tr>
<td>B (2.25%)</td>
<td>78%</td>
</tr>
<tr>
<td>C (3.75%)</td>
<td>82%</td>
</tr>
<tr>
<td>D (5.25%)</td>
<td>65%</td>
</tr>
<tr>
<td>E (6.75%)</td>
<td>73%</td>
</tr>
</tbody>
</table>

Table 1. Daily Growth Rate Average of Giant Freshwater Prawn in Juvenile Stages
Daily Growth Rate (%)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Daily Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Control (0%)</td>
<td>1.37 ± 0.005</td>
</tr>
<tr>
<td>B Papaya micro simplicia (2.25%)</td>
<td>1.69 ± 0.002</td>
</tr>
<tr>
<td>C Papaya micro simplicia (3.75%)</td>
<td>1.74 ± 0.003</td>
</tr>
<tr>
<td>D Papaya micro simplicia (5.25%)</td>
<td>1.52 ± 0.004</td>
</tr>
<tr>
<td>E Papaya micro simplicia (6.75%)</td>
<td>1.49 ± 0.003</td>
</tr>
</tbody>
</table>

The addition of papaya micro simplicia in commercial feed did not have a significant effect on the daily growth rate of giant freshwater prawns juvenile (Table 2). This is presumably due to the presence of tannins which are secondary metabolites in the papaya micro simplicia. Tannins can have a negative effect as an anti-nutritional agent. Anti-nutrient substances in tannins can bind with calcium, so these nutrients become less available in the body [16].

Growth activity of shrimp needs a lot of calcium mineral. The availability of calcium in feed can maintain the calcium balance in shrimp body so that the growth can be optimized [17].

Feed Utilization Efficiency

According to table 2, it is shown that the feed utilization efficiency in each treatment has a higher value than the control treatment. The obtained value of the feed utilization efficiency ranging from 30-40%, but it cannot be considered as a good category. The feed can be considered as a good category if it has a value of feed efficiency that reaches 50% or close to 100% [7].

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Feed Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Control (0%)</td>
<td>30 ± 0.14</td>
</tr>
<tr>
<td>B Papaya micro simplicia (2.25%)</td>
<td>36 ± 0.058</td>
</tr>
<tr>
<td>C Papaya micro simplicia (3.75%)</td>
<td>40 ± 0.046</td>
</tr>
<tr>
<td>D Papaya micro simplicia (5.25%)</td>
<td>34 ± 0.077</td>
</tr>
<tr>
<td>E Papaya micro simplicia (6.75%)</td>
<td>33 ± 0.064</td>
</tr>
</tbody>
</table>

The addition of papaya micro Simplicia on commercial feed did not have a significant effect on the efficiency of feed utilization. This was due to leaching out, which is the decay of dry matter caused by the length of feed immersion in water [18]. Leaching out causes the added papaya micro simplicia to become soluble in water so that the process of proteins breaking down to amino acids does not occur optimally. The immersion time of feed in water which resulting in leaching out, influenced by the habit of eating shrimp that is slow and takes a long time to consume the feed given so that the feed is exposed for a long period in the water [19].

Water Quality

In maintaining the water during the culture process, it has to meet water quality standards so that shrimp can grow optimally. Average water quality data that were observed during the research are shown in Table 3 as follows.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>DO (mg/L)</th>
<th>Temperature (°C)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Control (0%)</td>
<td>7.6 - 8.6</td>
<td>28 - 34</td>
<td>7.45 - 7.50</td>
</tr>
<tr>
<td>B Papaya micro simplicia (2.25%)</td>
<td>7.6 - 8.7</td>
<td>28 - 33</td>
<td>7.51 - 7.54</td>
</tr>
<tr>
<td>C Papaya micro simplicia (3.75%)</td>
<td>7.6 - 8.6</td>
<td>28 - 33</td>
<td>7.46 - 7.50</td>
</tr>
<tr>
<td>D Papaya micro simplicia (5.25%)</td>
<td>7.6 - 8.6</td>
<td>28 - 33</td>
<td>7.49 - 7.50</td>
</tr>
<tr>
<td>E Papaya micro simplicia (6.75%)</td>
<td>7.7 - 8.6</td>
<td>28 - 33</td>
<td>7.46 - 7.50</td>
</tr>
</tbody>
</table>

Water temperature observed during the culture ranging from 28 °C - 34 °C. This range meets the proper requirements for raising giant prawns. Prawns live optimally at water temperatures ranging from 28 °C - 30 °C [15].

Dissolved oxygen during the research ranged from 7.6 - 8.7 mg/L. This range meets the proper requirements for the growth
of giant prawns. Optimal dissolved oxygen levels for giant prawns at least 3 mg / L, if, below 3 mg / L, it causes stress [15]. In general, giant prawns have low oxygen tolerance in a short time, and in these conditions, giant prawns become less active and there is a decrease in appetite, it also caused shrimp to become aggressive so that it attacks other shrimp [20+

The degree of acidity (pH) during the study ranged from 7.45 - 7.54, this range fulfills the prope requirements for the growth of giant prawns. Freshwater giant prawns grow optimally in aquatic environments with a pH of 7 - 8.5 [15]. If the pH is below 4.5 and above 9.0 shrimp survival and growth can be disrupted because the shrimp will be weak, easily sick, and decreased appetite.

Conclusion

Based on the research, can be assumed that the addition of papaya Simplicia on commercial feed does not have a significant effect on survival rate, daily growth rate, and feed utilization efficiency. However, the addition of papaya micro-Simplicia dose to feed as much as 3.75% gives the highest value on survival (82%), daily growth rate (1.74% / day), and efficiency of feed utilization (40%).

References